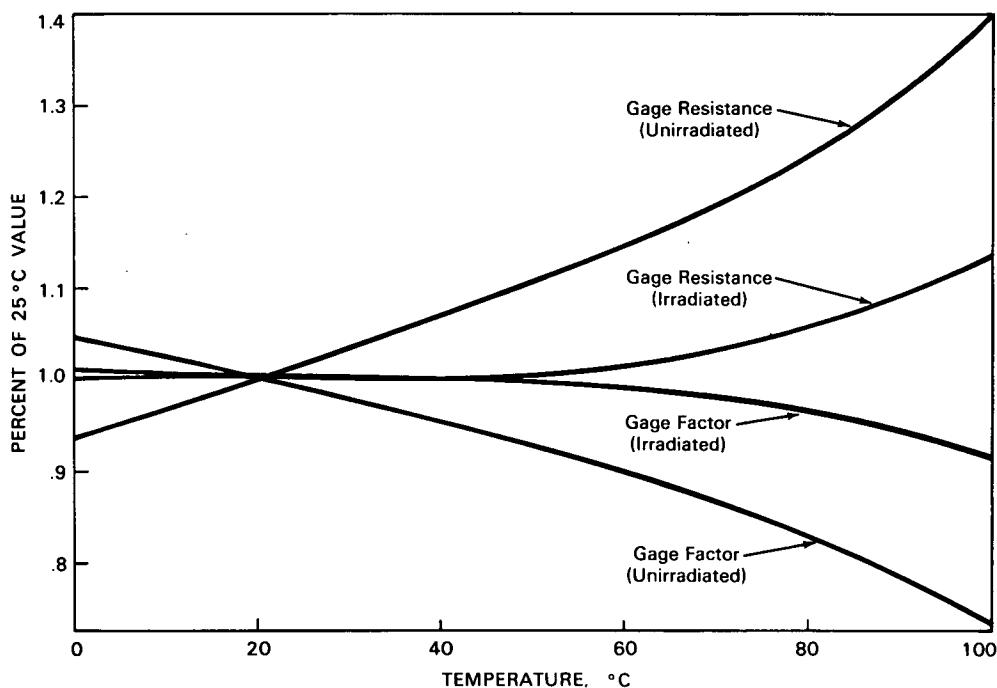


NASA TECH BRIEF



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Radiation Used to Temperature Compensate Semiconductor Strain Gages



The problem:

Presently available semiconductor strain gages have the disadvantage that either their thermal coefficient of resistance, or thermal coefficient of gage factor, or both, are fairly large at room temperature and above. These large temperature coefficients act as variables in the strain measurement and therefore limit the usefulness of the semiconductor strain gages.

The solution:

The temperature coefficients of resistance and gage factor of a range of resistivities of n- and p-type

silicon strain gages are greatly reduced by exposing them to high-energy electron radiation.

How it's done:

The semiconductor strain gages are placed in a homogeneous beam of electrons whose energies are between 1 and 3 MeV and are irradiated until their temperature coefficient of resistance at room temperature is reduced to zero. For n-type gages, this will occur when the gage resistance has increased by a factor of approximately two and for the p-type gage when the gage resistance has increased by a factor of approximately three. This method of reducing the

(continued overleaf)

temperature coefficients yields the best results for n-type silicon gages whose resistivity is between 0.1 and 1.0 ohm-cm. and for p-type silicon gages whose resistivity is between 5.0 and 10.0 ohm-cm.

After irradiation, the gages are heated to 175° C for a 24-hour period to stabilize their temperature coefficients. When this method is applied to a 1.0 ohm-cm n-type silicon gage, the results shown above are typical.

Note:

Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Langley Research Center
Langley Station
Hampton, Virginia, 23365
Reference: B66-10186

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C., 20546.

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